



**The SunSet 10G**

# SUNRISE TELECOM® SunSet® 10G

with Electrical Interface Ports

## Technical Specification

With support for twelve different optical and electrical rates from 1.5/2 Mbps through 10 Gbps, the SunSet 10G covers all test interfaces for core and metro SONET/SDH rings and their tributaries. With all-inclusive solutions for SDH, SONET, PDH, T-carrier, electrical and optical, the SunSet 10G increases testing efficiency, consolidates training, and saves money. And as optical networks reach across international boundaries, the SunSet 10G can turn up SDH and SONET services around the world.

Field engineers can verify proper hands-offs at SONET/SDH gateways; test network continuity across the 10G backbone network and analyze its tributaries; and test the OC-192/STM-64 wavelengths in the DWDM network. Applications include basic end-to-end performance testing with BERT, inservice performance monitoring, and simulating abnormal conditions to check the network's response. Regardless of line rate or transmission standard, everything from basic BERT to advanced APS and pointer testing is right at your fingertips.

## KEY FEATURES

- 2 kg handheld test set for SONET and SDH
- SONET and SDH testing from STS-1/STM-0 to OC-192/STM-64
- T-carrier and PDH testing from DS1/E1 to E4
- Dual wavelength transmitter up to 2.5 Gbps
- Mapping/demapping from STS-192c, SPE/VC4-64c Bulk down to VT1.5, VT2, VC11, VC12
- Mux testing (SDH to SDH, SDH to PDH, SONET to SONET, SONET to T-carrier)
- SONET/SDH overheard byte access and control
- Battery operated: one hour operating time at 10 Gbps
- Economical for wide deployment
- Windows Remote Control
- Verify network continuity with BER testing
- Easily detect SDH/SONET errors and alarms with LEDs and Well-organized results
- Confirm proper frequency and power level
- Monitor pointer movement in the network and adjust pointer values to stress network elements

- Identify network synchronization problems by connecting the external clock input to the synchronization timing source of the network
- Check the network's automatic protection switch (APS) function and measure network switchover time
- Troubleshoot problems across multiple network operators with Tandem Connection Monitoring (TCM)

## BENEFITS

- SONET/SDH/PDH/T-Carrier feature-rich
- Lightweight and highly portable
- Eliminates the need for multiple and heavier instruments without compromising test features or accuracy
- Intuitive and easy-to-use
- Cost-effective and future proof
- Increases efficiency
- Consolidates training and shortens learning curve
- Handles multiple tasks including installation, maintenance, troubleshooting, and commissioning

## APPLICATIONS

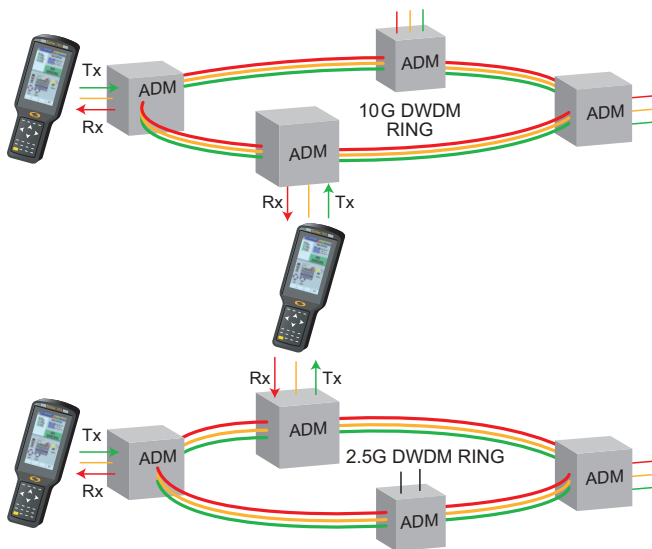
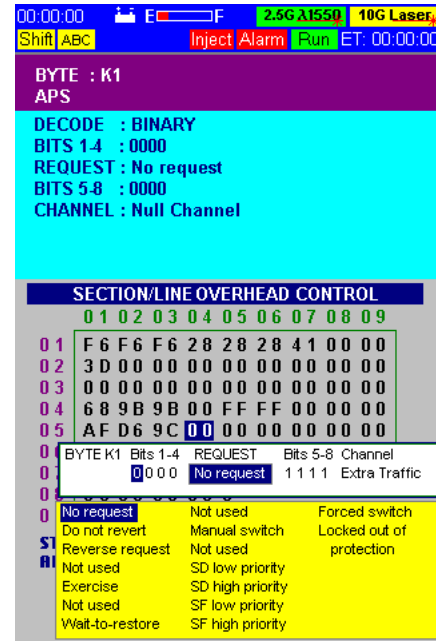
### Out-of-Service testing

- End-to-end BER testing
- Network element verification
- Overhead control
- Pointer adjustment and test sequences
- Propagation delay measurements
- Mux testing (SDH-SDH, SONET-SONET, PDH-SDH, T-carrier-SONET)

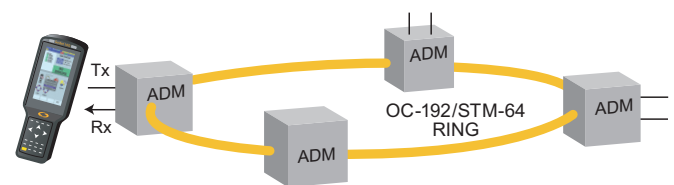
### In-service monitoring

- In-service performance analysis
- Overhead monitor and decode
- Pointer monitoring
- APS measurements
- Tandem Connection monitoring
- Tributary scan
- With splitter or through mode

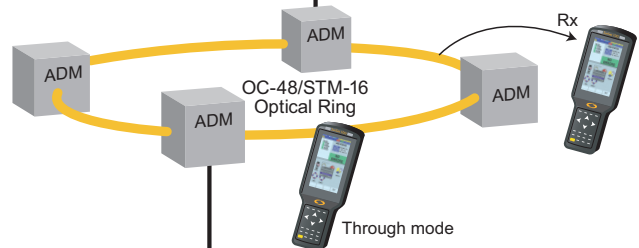
### SS10G+ OverHead Control Screen Shot



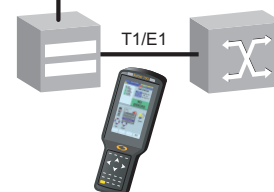
### CORE



### METRO



### ACCESS



## SPECIFICATIONS

### Test Interfaces

### SDH/SONET

#### 10G Optical (STM-64/OC-192)

Port/Connector: FCUPC or SCUPC

Mode: Single Mode compatible

Line coding: NRZ

Complies to Telcordia GR-253 (September 2000 issue) and ITU-T G.691

#### Transmitter

Clock source

Internal: 9.95328 Gbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

External: Synchronization to external 2.048 MHz or 2.048 Mbit/s (SDH), 1.544 Mbit/s (SONET)

Output power range

1550 nm Short Reach: -4 to -1 dBm

1310 nm Intermediate Reach: -1 to +2 dBm

Laser Safety: IEC60825-1/2001, Class 1, 21 CFR 1040.10 and 1040.11

Extinction ratio: 8.2 dB min, 10 dB typ.

Test patterns

$2^{31}-1$ ,  $2^{23}-1$ , All 1s, All 0s, Alt 1010, 1 in 4, 1 in 8

10 Programmable 16-bit user patterns

Test pattern inversion

#### Receiver

Frequency recovery range: 9.95328  $\pm$  50 ppm

Wavelength: 1290 to 1600 nm

Input power range

1550 nm Short Reach, PIN detector: -15 to 0 dBm

1310 nm Intermediate Reach, PIN detector: -17 to 0 dBm

Maximum input power: +7 dBm

#### 52M/155M/622M/2.5G Optical (STM-0/1/4/16 OC-1/3/12/48)

Port/Connector: FCUPC or SCUPC

Mode: Single Mode compatible

Line coding: NRZ

Complies to Telcordia GR-253 (September 2000 issue) and ITU-T G.957

#### Transmitter

Clock source

Internal

- Bit rates

51.840 Mbit/s  $\pm$  4.5 ppm

155.520 Mbit/s  $\pm$  4.5 ppm

622.080 Mbit/s  $\pm$  4.5 ppm

2.48832 Gbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

External: Synchronization to external 2.048 Mbit/s or 2.048 MHz (SDH), or 1.544 Mbit/s (SONET)

Output power range

1310/1550 nm Intermediate Reach: -5 to 0 dBm

1310/1550 nm Long Reach: -2 to +3 dBm

Laser Safety: IEC60825-1/2001, Class 1, 21 CFR 1040.10 and 1040.11

Extinction ratio: 8.2 dB min, 10 dB typ.

Test patterns

$2^{23}-1$ ,  $2^{20}-1$ ,  $2^{15}-1$ ,  $2^{11}-1$ ,  $2^9-1$ ,  $2^7-1$ ,  $2^6-1$ , All 1s, All 0s, Alt 1010, 1 in 4, 1 in 8

10 Programmable 16-bit user patterns

Test pattern inversion

#### Receiver

Frequency recovery range:

51.840 Mbit/s  $\pm$  50 ppm

155.520 Mbit/s  $\pm$  50 ppm

622.080 Mbit/s  $\pm$  50 ppm

2.48832 Gbit/s  $\pm$  50 ppm

Wavelength: 1280 to 1580 nm

Input power range:

1310/1550 nm Intermediate Reach: -20 to -3 dBm

1310/1550 nm Long Reach: -27 to -9 dBm

Maximum input power:

1310/1550 nm Intermediate Reach: +3 dBm

1310/1550 nm Long Reach: -5 dBm

#### SDH/SONET 155M Electrical (STM-1/STS-3)

Port/Connector: 75 $\Omega$  unbalanced BNC (f)

Line coding: CMI

Complies to Telcordia GR-253 (September 2000 issue) & ITU-T G.957

#### Transmitter

Clock source

Internal: 155.520 Mbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

External: Synchronization to external 2.048 MHz or 2.048 Mbit/s (SDH), via 1.544 MHz or 1.544 Mbit/s (SONET)

Pulse shape: Conforms to ITU-T G.703

Framing: Conforms to ITU-T G.707

#### Receiver

Frequency recovery range: 155.520 Mbit/s  $\pm$  150 ppm

Input power range

Terminate: 12.7 dB cable loss

Monitor: 20 dB resistive loss plus 12 dB cable loss

Jitter tolerance: Conforms to ITU-T G.825

#### SDH/SONET 52M Electrical (STM-0/STS-1)

Port/Connector: 75 $\Omega$ , unbalanced BNC (f)

Line coding: B3ZS

Complies to Telcordia GR-253 (September 2000 issue) & ITU-T G.691

#### Transmitter

Clock source

Internal: 51.840 Mbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

External: Synchronization to external 2.048 MHz or 2.048 Mbit/s (SDH), via 1.544 MHz or 1.544 Mbit/s (SONET)

Pulse shape: Conforms to ITU-R F.750-3

Framing: Conforms to ITU-T G.707 Annex A

#### Receiver

Frequency recovery range: 51.840 Mbit/s  $\pm$  50 ppm

Input power range

Terminate: 10.8 dB cable loss

Monitor: +3 to -26 dB resistive loss

Jitter tolerance: Conforms to ITU-T G.825

## PDH/T-CARRIER

### 139M/E4

#### Transmitter

##### Clock source

Internal : 139.264 Mbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

Pulse shape: Conforms to ITU-T G.703

Line coding: CMI

Framing: Unframed, Framed, Structured per ITU-T G.751

Loop: Recovered from received signal

##### Error injection

Code, Bit, FAS

Programmable error burst 1 to 9999 count or error rate  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

Alarm generation: AIS, FAS RAI

#### Receiver

Frequency recovery range: 139.264 Mbit/s  $\pm$  150 ppm

##### Input power range

Terminate: 12 dB cable loss

Monitor: 20 dB resistive loss plus 12 dB cable loss

Jitter tolerance: Conforms to ITU-T G.823

Impedance: 75 $\Omega$ , unbalanced

Port/Connector: 75 $\Omega$ , unbalanced BNC (f)

### 45M/DS3

#### Transmitter

##### Clock source

Internal: 44.736 Mbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

Pulse shape: Conforms to ITU-T G.703

Line coding: B3ZS

Framing: Unframed, M13, and C-bit

Port/Connector: 75 $\Omega$ , unbalanced BNC (f)

##### Error injection

Code, Bit, Frame, C-bit, P-bit, FEBE

Programmable error burst 1 to 9999 count, or error rate  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

Alarm generation: AIS, Yellow, Idle

#### Receiver

Frequency recovery range: 44.736 Mbit/s  $\pm$  50 ppm

##### Input power range

Terminate: Up to -6 dB cable loss

Monitor: +6 dB to -26 dB resistive loss

Jitter tolerance: Conforms to ITU-T G.824

##### Impedance

Terminate, Monitor: 75 $\Omega$ , unbalanced

Port/Connector: 75 $\Omega$ , unbalanced BNC (f)

### 34M/E3

#### Transmitter

##### Clock source

Internal: 34.368 Mbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

Pulse shape: Conforms to ITU-T G.703

Line coding: HDB3

Framing: Framed, Unframed, Structured per ITU-T G.742, G.751

Port/Connector: 75 $\Omega$ , unbalanced BNC (f)

##### Error injection

Code, Bit, FAS

Programmable error burst 1 to 9999 count, or error rate  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

Alarm generation: AIS, FAS RAI

#### Receiver

Frequency recovery range: 34.368 Mbit/s  $\pm$  50 ppm

##### Input power range

Terminate: -12 dB cable loss

Monitor: -20 dB resistive loss plus -12 dB cable loss

Jitter tolerance: Conforms to ITU-T G.823

Impedance: 75 $\Omega$ , unbalanced

Port/Connector: 75 $\Omega$ , unbalanced BNC (f)

### 2M/E1

#### Transmitter

##### Clock source

Internal: Bit rate: 2.048 Mbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

External: Synchronization to external 2.048 MHz or 2.048 Mbit/s

Pulse shape: Conforms to ITU-T G.703 for balanced (120 $\Omega$ ) interfaces

Line coding: AMI, HDB3

Framing: Unframed, PCM-30, PCM-30C, PCM-31, PCM-31C conforms to ITU-T G.704

##### Port/Connector

120 $\Omega$  (standard): balanced RJ-45 (f)

##### Error injection

Code, Bit, CRC-4, E-bit, FAS

Programmable error burst 1 to 9999 count, or error rate  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

Alarm Generation: AIS, FAS RAI, MFAS RAI

##### Fractional E1

Error measurements, channel configuration verification

N or M (noncontiguous)  $\times$  64 kbit/s, N=1 to 31

Set Tx and Rx channels independently

Through mode: Test pattern on selected channels; all others through

#### Receiver

Frequency recovery range: 2.048 Mbit/s  $\pm$  50 ppm

##### Input power range

Terminate, Bridge: +6 to -43 dB with ALBO

Monitor: -20 dB resistive loss plus -6 dB cable loss

Jitter tolerance: Conforms to ITU-T G.823

##### Impedance

Terminate, Monitor: 120 $\Omega$  balanced

Bridge: > 5000 $\Omega$

Port/Connector: 120 $\Omega$ , balanced RJ-45 (f)

Level measurements (dBm)

### 1.5M/DS1

#### Transmitter

##### Clock source

Internal: 1.544 Mbit/s  $\pm$  4.5 ppm

Receive: Recovered from received signal

External: Synchronization to external 1.544 Mbit/s

Pulse shape: Conforms to ITU-T G.703

Line coding: AMI, B8ZS

Framing: Unframed, SF-D4, ESF. Conforms to ANSI T1.102, 107,

107A, 403, and 404. Also Telcordia TR-TSY-000009 and TR-TSY-000191.

Port/Connector: 100Ω, balanced RJ45 (f)

Error injection

BPV, Logic, CRC-6, Frame

Programmable error burst 1 to 9999 count, or error rate  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

Alarm generation: AIS, Yellow, Idle

Fractional T1

Error measurements, channel configuration verification

Nx64 kbit/s, Nx56 kbit/s, N=1 to 24

Set Tx and Rx channels independently

Through mode: Test pattern on selected channels; all others through

## Receiver

Frequency recovery range: 1.544 Mbit/s  $\pm$  50 ppm

Input power range

Terminate, Bridge: +6 to -36 dB cable loss

Monitor: -15 to -25 dB, resistive loss

Jitter tolerance: Conforms to ITU-T G.824

Impedance

Terminate, Monitor Mode: 100Ω, balanced

Bridge: > 5000Ω

Port/Connector

100Ω, balanced RJ-45 (f)

Level measurements (dBm)

## Test Features

## Test Modes

Point-to-point: Tx and Rx are set to the same rate

Unframed Mode: Disables SDH/SONET overhead or PDH/T-carrier framing

Through Mode Operation (up to 10G)

Line through

- Passes entire signal through with no manipulation of overhead or injection of errors or alarms

- Overhead can be monitored; alarms and errors measured

Payload through

- Passes payload through

- Passes all Path overhead through

- Injects SOH errors/alarms

- Controls SOH overhead, except pointers

## SDH-PDH Mux/Demux Testing

The test pattern is generated on the low or high rate port and the BERT is measured on the opposite port. The following combinations are applicable:

- 10G 0/139M • 2.5G 0/139M • 622M 0/139M • 155M E (0)/139M
- 10G 0/45M • 2.5G 0/45M • 622M 0/45M • 155M E (0)/45M
- 10G 0/34M • 2.5G 0/34M • 622M 0/34M • 155M E (0)/34M
- 10G 0/2M • 2.5G 0/2M • 622M 0/2M • 155M E (0)/2M
- 10G 0/1.5M • 2.5G 0/1.5M • 622M 0/1.5M • 155M E (0)/1.5M

## SDH-SDH Mux/Demux Testing

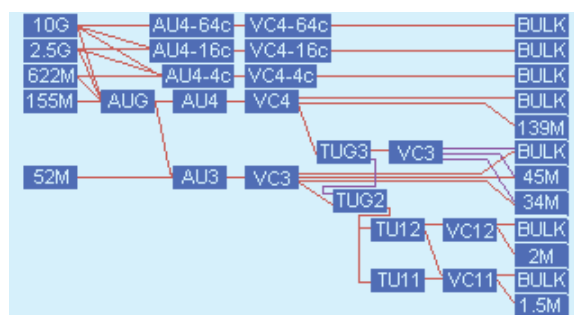
The following combinations are applicable:

- 10G 0/2.5G 0
- 10G 0/622M 0 • 2.5G 0/622M 0 • 622M 0/155M E (0) • 155M E (0)/52M E
- 10G 0/155M E (0) • 2.5G 0/155M E (0) • 622M 0/52M E (0)
- 10G 0/52M E • 2.5G 0/52M E (0)

MuxMode: Emulation of a mux for 1.5M, 2M, 34M, 45M, and 139M payloads

## SDH (ITU-T G.707)

Rates: STM-64 (9.9 Gbit/s), STM-16 (2.5 Gbit/s), STM-4 (622 Mbit/s), STM-1 (155 Mbit/s), STM-0 (52 Mbit/s)



Payloads: VC4-64c, VC4-16c, VC4-8c, VC4-4c, VC4-3c, VC4-2c, VC4 Bulk, VC3 Bulk, 45M, 34M, 2M Async, 1.5M Async, VC12 Bulk, VC11 Bulk

ITU-T Mapping

Error Injection: B1, B2, B3, FASE, MS-REI, HP-REI, LP-REI, BIP-2, Bit

Error Injection Count: Programmable error burst of 1 to 9999

Error Injection Rate:  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

Alarm Generation: LOS, LOF, RS-TIM, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, HP-PLM, HP-TIM, LP-RDI, LP-RFI, LP-PLM, LP-UNEQ, LP-TIM, TU-LOM, TU-LOP, TU-AIS

Results Measurements

Errors: B1, B2, B3, FASE, MS-REI, HP-REI, LP-REI, BIP-2, Bit

Alarms: LOS, LOF, OOF, RS-TIM, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, HP-PLM, HP-TIM, LP-RDI, LP-RFI, LP-PLM, LP-UNEQ, LP-TIM

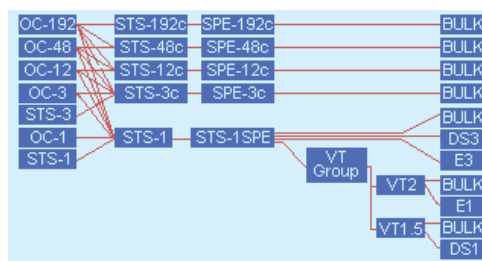
Performance monitoring: G.821, G.826, G.828, G.829, M.2100/2110, M.2101/M.2120

SDH Pointer: Justification, Increase, Decrease

Automatic Tributary Scan: 80 characters/line report of alarms/errors per tributary. In-service and out-of-service for 1.5M, 2M, 34M, 45M, 139M, VC3 Bulk, and VC4 Bulk inside STM1/4/16 with full report.

## SONET (Telcordia GR-253-CORE)

Rates: OC-192 (9.9 Gbit/s), OC-48 (2.5 Gbit/s), OC-12 (622 Mbit/s), OC-3/STS-3 (155 Mbit/s), OC-1/STS-1 (52 Mbit/s)



Payloads: STS-192c, STS-48c, STS-24c, STS-12c, STS-9c, STS-6c, STS-3c, STS-1, DS3, E3, VT2, E1 Async, VT1.5 Bulk, DS1 Async  
Error Injection: B1, B2, B3, BIP-V, Frame, REI-L, REI-P, REI-V, Bit  
Error Injection Count: Programmable error burst of 1 to 9999  
Error Injection Rate:  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

Alarm Generation: LOS, LOF, AIS, AIS-L, RDI-L, LOP-P, AIS-P, RDI-P, PLM-P, TIM-P, UNEQ-P, AIS-V, RDI-V, LOP-V, PLM-V, TIM-V, UNEQ-V, LOM

#### Results Measurements

GR-253 Bit Performance: FC (failure counts), BER, LOPS (loss of pattern sync), %LOPS, ES (errored seconds), %ES, SES (severely errored seconds), %SES, UAS (unavailable seconds), %UAS, EFS (error free seconds), %EFS

SONET defects: LOS, LOF, AIS, AIS-L, RDI-L, LOP-P, AIS-P, RDI-P, PLM-P, TIM-P, UNEQ-P, AIS-V, RDI-V, LOP-V, PLM-V, TIM-V, UNEQ-V, LOM, B1, B2, B3, BIP-V, Frame, REI-L, REI-P, REI-V, FC (failure counts), ES (errored seconds), %ES, SES (severely errored seconds), %SES, UAS (unavailable seconds), %UAS, EFS (error free seconds), %EFS

SONET Pointer: Justification, Increase, Decrease

### Measurements Common to SDH/SONET

#### Histogram Analysis

Graphical display of SDH/SONET/PDH/T-carriers defects and anomalies

#### Resolution

- Last hour with 1 second resolution
- Last 3 days with 1 minute resolution
- Up to 57 days with 15 minutes resolution

#### Service Disruption Measurement

Resolution: 1 frame (125 ns)

Accuracy: < 50 ns

#### Propagation Delay Measurement

Round trip signal transmission delay

Measures in ns and UI (Unit Intervals) – from 6 ns to 10 sec

#### General

Continuous measurement

Elapsed time

Optical power level measurement

Frequency: Received, Maximum, Minimum (frequency deviation in ppm),  $\pm$  Wander, Clock slips

### SDH/SONET Overhead

Monitor and Transmit Section/Regenerator Section, Line/Multiplex Section, and Path Overhead bytes

ASCII decode of 16-byte or 64-byte HP/STS or LP/VT Path Trace bytes (J1/J2)

Programming K1/K2 APS signaling bytes per ITU-T G.783/G.841

K1 and K2 byte capture: 20 transitions (minimum)

Time resolution: 125 ns

Linear and Ring decode of bytes

J0 Section Trace Generation: 1 byte SAPI format or 16 bytes E.164 ASCII sequence + CRC-7

S1 Synchronization Status Messages decode & generation

Path Overhead Monitor

Programmable Orderwire bytes (E1, E2) in binary or HEX format

#### Programming of Path Overhead bytes

J1/J2 Path Trace Generation: 16 bytes E.164 ASCII sequence + CRC-7 or 64 bytes E.164 ASCII sequence

DCC BER testing through D1 to D3 bytes or D4 to D12 bytes

Pattern selection  $2^{23}-1$ ,  $2^{20}-1$ ,  $2^{15}-1$ ,  $2^{11}-1$

C2 signal label byte programming in binary or hexadecimal

G1 bit 5: RDI generation

User programmable path user bytes (F2, F3)

Programmable K3 (24), K4 (27) bytes (bits 1-4) for APS signaling

V5 byte: Signal label generation (bits 5-7), Extended signal label generation/decode (K4 byte), Enhanced RDI generation/detection

Pointer Monitor: H1, H2, V1, V2 bytes

Pointer Adjustment: Programming of pointer value, NDF, and SS bits

#### Pointer Test Control

Modes: Single, burst of 2-8 consecutive justifications

Select increment, decrement, or alternate the pointer value

G.783/GR-253 Pointer Test Sequences

- AU/STS or TU/VT pointer
- Sequences: Single, Burst, Phase, Transient Burst, Periodic, 87-3, 26-1, Opposite (Increase + Decrease), and Custom
- Movement: Increase, Decrease, Increase + Decrease
- Anomalies: Added, Cancel, and None

#### APS Timing Measurement

Resolution: 1 ms

Accuracy: 1 ms

Sensors: LOS, LOF, MS-AIS/AIS-L, MS-RDI/RDI-L, AU-AIS/AIS-P, HP-RDI/RDI-P, TU-AIS/AIS-V, LP-RDI/RDI-V

Pass/Fail Indicator

User selectable switch and gate time

#### Tandem Connections Monitoring

N1, N2 bytes for High and Low Order Paths

Analysis of the data, display of data in the form of alarms, performance figures, and APId messages as specified in ITU-T G.707

Generation and detection of the following parameters:

- Loss of Tandem Connection (LTC)
- Incoming Error Count (IEC)
- Tandem Connection Remote Error Indication (TC-REI)
- Tandem Connection Alarm Indication Signal (TC-AIS)
- Tandem Connection Remote Defect Indication (TC-RDI)
- Tandem Connection Outgoing Defect Indication (TC-ODI)
- Tandem Connection Outgoing Error Indication (TC-OEI)
- Tandem Connection UnEquip (TC-UNEQ)

### PDH Measurements (139M, 45M, 34M, 2M, 1.5M)

Typical Error Type Reports: Total error count, error rate, ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS, AS, %AS

ITU-T G.821 Analysis

ITU-T G.826 Analysis: Based on anomalies, defects, far end indications

M.2100 Analysis (Maintenance or BIS)

Frequency Measurements: Moving bar graph of slip count, max frequency, min frequency, frequency deviation in ppm, clock slips, max positive wander, max negative wander

## Alarm Statistics

LOS Seconds, LOF Seconds, AIS Seconds  
FAS RAI Seconds (2M, 34M, 139M)  
MFAS RAI Seconds (2M only)  
Yellow Alarm Seconds (1.5M, 45M)

## T-Carrier Measurements (DS1, E1, E3, DS3, E4)

### Error Type

Code (BPV), F-bit, P-bit, C-bit, FEBE, CRC-6 (DS1, DS3)  
Code, Bit, FASE (E1, E2, E3, E4)  
CRC-4, E-bit (E1)

Typical Error Type Reports: Total error count, error rate, ES, %ES,  
SES, %SES, UAS, %UAS, EFS, %EFS, AS, %AS

### GR-253 Analysis

Frequency Measurements: Moving bar graph of slip count, max  
frequency, min frequency, frequency deviation in ppm, clock  
slips, max positive wander, max negative wander

### Alarm Statistics

LOS Seconds, LOF Seconds, AIS Seconds  
FAS RAI Seconds (2M, 34M, 139M)  
MFAS RAI Seconds (2M only)  
Yellow Alarm Seconds (1.5M, 45M)

## Error Injection

### Error Type

Code, Bit, FASE (2M, 8M, 34M, 139M)  
CRC-4, E-bit (2M)  
Code (BPV), F-bit, P-bit, C-bit, FEBE, CRC-6 (1.5M, 45M)

Programmable error burst 1 to 9999 count or error rate of  $2 \times 10^{-3}$   
to  $1 \times 10^{-9}$

## Alarm Generation

LOS, LOF, AIS (1.5M, 2M, 8M, 34M, 45M, 139M)  
FAS RAI (2M, 8M, 34M, 139M)  
MFAS RAI (2M only)  
Yellow Alarm, Idle (1.5M, 45M)

## Propagation Delay Measurement

Round trip signal transmission delay  
Measures in ns and UI (Unit Intervals)

## Other Features

### Auto Configuration

Single button configuration  
Automatically scans all test interfaces for signal  
Configures test set based on received signal. Sets rate, mapping,  
and test pattern

System Profiles: Store up to 100 system configurations

## General

Display: TFT, 640 × 480 pixel color, Indoor/Outdoor readable  
Soft LEDs on display: Signal, Alarm, Frame, Errors, Pointer  
Rubber keypad  
Network: 10/100Base-T RJ-45  
Serial Port: RS-232C (V.24), RJ-11 connector  
DC Power for battery charger and continuous operation

Battery: Built-in Li-Ion rechargeable field replaceable battery pack  
Operating temperature: 0°C to 45°C [32°F to 113°F]  
Storage temperature: -20°C to 70°C [-4°F to 158°F]  
Operating humidity: 5% to 90% noncondensing  
Size: 122 x 99 x 300 mm [4.8 x 3.9 x 11.8 in]  
Weight: 2.2 kg [5 lbs]  
Integrated tilt stand with protective rubber holster

## ORDERING INFORMATION

### Test Set

SS10GP-25 STM-64/OC-192 and STM-0/1/4/16/OC-1/3/12/  
48 SDH/SONET Test Set. 1.5M/2M testing, 8-pin  
RJ-45 connector. 34M/45M/52M/139M/155M  
testing, BNC connectors.

### STM-64 Optics Options

*[These options are mutually exclusive]*

SS10GP-13IR 10 Gb/s 1310m Intermediate Reach (24Km) Tx/Rx  
Pin Detector  
SS10GP-15SR 10 Gb/s 1550m Short Reach (20Km) Tx/Rx  
Pin Detector

### STM-0/1/4/16 Optics Options

*[These options are mutually exclusive]*

SS10GP-25-SW1 2.5 GB/s 1310nm intermediate Reach Tx/Rx  
SS10GP-25-DW2 2.5 Gb/s 1310 nm Intermediate Reach Tx,  
1550 nm Intermediate Reach Tx, Intermediate  
Reach Rx  
SS10GP-25-DW5 2.5 Gb/s 1310nm/1550 nm Long Reach Tx, Long  
Reach Rx

### Optical Connector Options (SC or FC)

*[These options are mutually exclusive, based on chassis selection. Must select  
only one]*

SS10GP-25-SC SS10GP-25 SCUPC Optical Connectors  
SS10GP-25-FC SS10GP-25 FCUPC Optical Connectors

## Accessories Options

### Standard Accessories

SS10GP-101 SS10GP User's Manual  
SA140 AC Power Adapter  
SS10GP-RH SS10GP Rubber Holster

### Power Cord

SA155-EU 2-Prong power cord plus ground for use in Europe  
(Except UK)  
SA155-NA 3-prong power cord for use in Latin America, North  
America, and Asia  
SA155-UK 3-prong power cord for use in United Kingdom

### Warranty

SS10GP-W3 Standard 3 year warranty. [Excludes Battery and  
Accessories, which are warranted for one-year]  
SS10GP-W4 4 year warranty [Excludes Battery and Accessories,  
which are warranted for one-year]

## Software Option

SW10GP-DEI	Disable Electrical Interfaces [Must be specified with a chassis at the time of order]
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## Calibration Options

SS10GP-CCM	Certificate of calibration with measurement data [Must be specified at time of order]
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## Optical Accessories

SA501	Optical Patch Cord, SMF, FC-PC to SC-PC, 6'
SA502	Optical Patch Cord, SMF, FC-PC to SC-PC, 6'
SA503	Optical Patch Cord, SMF, FC-PC to ST-PC, 6'
SA507	Optical Patch Cord, LCUPC to LCUPC, 6'
SA508	Optical Patch Cord, LCUPC to SCUPC, 6'
SA509	Optical Patch Cord, LCUPC to FCUPC, 6'
SA511	Optical Patch Cord, SC to SC, 6'
SA512	Optical Patch Cord, SC to ST, 6'
SA521	Optical Attenuator, FC-PC, -10 dB
SA523	Optical Connector Adapter FC/PC to SC/PC
SA524	Optical Connector Adapter SC/PC to FC/PC [Changes a SC (f) appearance to a FC (f) appearance]
SA531	Optical Attenuator, SC-PC, -10 dB
SA541	Optical Splitter, FC-PC, 90/10
SA545	Optical Splitter, FC-PC, 50/50
SA551	Optical Splitter, SC-PC, 90/10
SA555	Optical Splitter, SC-PC, 50/50

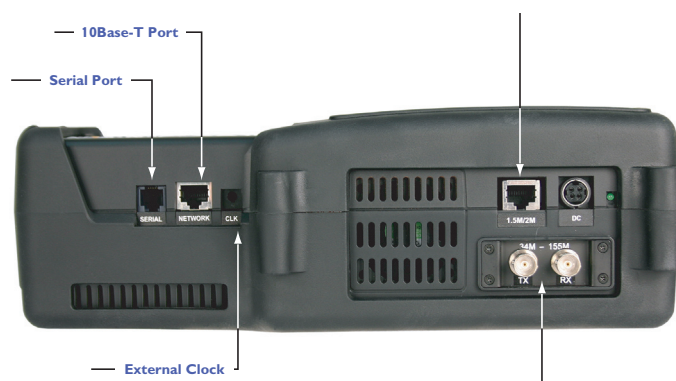
## Other Accessories

SS101	Carrying Case
SS106	Cable, Single Bantam (m) 120Ω to Single Bantam (m) 120 Ω, 6'
SS108	Cable, Single Bantam (m) 120Ω to Single 310 (m) 120Ω, 6'
SS109	Cable, Single Bantam (m) 120Ω to Alligator Clips 120Ω, 6'
SS110	Cable, Dual Bantam (m) 120Ω to 15-pin D connector (m) 120Ω, 6'
SS112	Cable, Two Single Bantams (m) 120Ω to RJ-48 8-position Modular Plug (m) 120Ω, 6'
SS211	Cable, BNC (m) 75Ω to BNC (m) 75Ω, 6'
SS212	Cable, Single Bantam (m) 120Ω to BNC (m) 75Ω, 6'
SS220	Conversion Cable, BNC (m) 75Ω to 1.6/5.6 mm (m) 75Ω, 6'
SS225	Cable, Bantam (m) 120Ω to 3-pin banana CF (m) 120Ω, 6'
SS227	Conversion Cable, BNC (m) 75Ω to probe clips 120Ω, 6'
SS423	Cable, RJ45 (m) to RJ45 (m) with shield, 6'
SS430-WT-OPT	Sunrise Optical Cable Kit [Includes Sunrise Cable Kit (SA440), (2) Optical Patch Cord, SC to SC, 6' (SA511), and Optical Attenuator, SC-PC, -10 dB (SA531)]
SS434	Cable, RJ48 (m) 120Ω to two 3-pin Banana CF (m) 120Ω, 6'
SS436	Conversion Cable, RJ48 (m) 120Ω to two BNC (m) 75Ω, 6'

## Replacement

SA130	High Capacity Li-Lon Battery Pack for SunSet 10G.
SA140	AC Power Adapter. SA155-EU 2-Prong power cord plus ground for use in Europe (Except UK)
SA155-NA	3-prong power cord for use in Latin America, North America, and Asia
SA155-UK	3-prong power cord for use in United Kingdom
SS10GP-RH	SS10GP Rubber Holster
SS10GP-101	SS10GP User's Manual
SS10G-HC	SS10GP Hard Carrying Case

## SunSet® 10G with Electrical Interface Ports



\* Conversion cables available for all standard T1/E1 interfaces, including Bantam, 3-pin banana, and BNC.